REMARKS

Amendments

The specification has been amended to provide serial number and publication information at page 17. The outstanding Office Action noted that incorporation of essential material in the specification by reference to an unpublished application is improper. It is respectfully submitted that the present application provides all required information to meet requirements of the Patent Laws without the need to refer to additional applications, patents or publications. Further, the applications indicated at page 17 have been published, and this information is now noted in the specification by amendment.

Claims 1, 12 and 24 have been amended to expressly recite that the charge control adjuvant is provided as an element separate from the charged toner particles, that the adjuvant or the matrix containing the adjuvant has limited solubility in the liquid carrier, and that the charge control adjuvant is provided in an amount higher than the solubility of the adjuvant or the matrix in the liquid carrier. Antecedent basis for this amendment is found throughout the specification, and particularly at page 6, lines 4-9 and lines 13-22.

Claims 28-30 have been amended to clarify the method, specifically stating that the charge of the toner composition is modulated by contact of the charge control adjuvant with the liquid composition. Antecedent basis for this amendment may be found, for example, at page 8, lines 20-23.

It is respectfully submitted that the present amendments do not introduce new matter.

Claim Rejections Under 35 USC § 112

Claims 1-30 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

More specifically, claims 1-27 are rejected as not providing steps in the printing or the arrangement of the printing. These claims, however, are system claims, and therefore relate to the article of manufacture as embodied in a printer. These claims are to be differentiated from the method claims 28-30, which properly recite steps that are carried out in a printing process. It is respectfully submitted that no steps need be called out in these claims.

The Office Action further points out regarding claim 2 that the solubility of the adjuvant will change by the condition of the solvent under different temperatures. The claim, however, is drawn to an article of manufacture, which is a static structure. The claim simply requires that, as provided (i.e. at the operating temperature in which the printer is to be operated), this system comprises a charge control adjuvant having limited solubility in the liquid carrier. The Office Action queries whether the adjuvant is insoluble. As discussed in the specification, the charge control adjuvant has a limited solubility in the liquid carrier, so that even if a portion of the adjuvant may be solubilized by the liquid carrier, the adjuvant will be present as a component that is an identifiable element present in the system in the form, for example, of a solid brick of material attached to the bottom or a wall of the liquid carrier reservoir (as shown in Figs. 1 and 2, as a coating on a conveyer roll as shown in Fig. 3, or as dispersed microcapsules as shown in Fig. 4.

Relative to Claims 5 and 8, the Office Action queries how the adjuvant is affixed to the wall or coated on the conveying roll. These embodiments are discussed in the specification at page 6, lines 14-22 and page 7, line 26 to page 8, line 2. It is respectfully submitted that the skilled artisan, provided with this teaching, is very capable of identifying any number of techniques of affixing a solid block of material or as a coating to a surface, such as by mechanical retention or chemical adhesion means that immediately come to mind. Relative to claims 12 and 24, the matrix and microcapsules are specifically discussed in the specification at page 6, lines 6-12 and at page 10, lines 14-19.

It is respectfully submitted that the skilled artisan would find the present claims to be distinctly claimed in view of the plain language of the claim, the teaching provided by the specification, and the understanding expected of a routineer in this art.

Claim Rejections Under 35 USC § 103

Claims 1-30 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Alexandrovich et al in view of Veillette et al, Yamamoto et al and Kosel.

The present invention relates to systems for printing a liquid toner that comprise a charge control adjuvant having limited solubility in the liquid carrier. This charge control adjuvant modulates the bulk conductivity of the toner composition and/or the charge per mass of the toner particles in the toner composition without using mechanical or electronic sensing apparatuses or complex control systems. The charge control adjuvant is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier.

In review of the toner art, one recognizes that the various components of a liquid toner are not always identified by the same name. Thus, the component that supplies a charge on a toner particle may be called a charge director in one document, a charge control agent in another, a charge control additive in another, a charge control adjuvant in another, and so on. For clarity, the function of the components discussed in the present application will be reviewed.

As discussed in the specification, a liquid toner comprises particles in a liquid carrier, wherein the particles comprise a polymeric binder that is charged. Typically, the charge results from incorporation of a charge director (the term that will be uniformly applied in the present discussion) that is associated with the particle, for example by copolymerizing a suitable monomer with the other monomers used to form the copolymer, chemically reacting the charge director with the toner particle, chemically or physically adsorbing the charge director onto the toner particle (resin or pigment), or chelating the charge director to a functional group incorporated into the toner particle. See the present specification at page 15, lines 16-20. The charge control adjuvant is an element that is different from the charge director. The charge control adjuvant is any material that modulates the bulk conductivity of the toner composition and/or the charge per mass of the toner particles in the toner composition. The charge control adjuvant does not impart a charge to the toner particles, but rather regulates the bulk solution charge. Preferred charge control adjuvants are acids or bases. As discussed in the Background section of the present application, previous systems that have attempted to resolve the charge issues that arise when toner particles are removed from a liquid system have required addition of soluble charged components and/or careful monitoring of conductivity of the liquid developer during the printing process.

The present invention provides a unique solution to control of bulk conductivity of the toner composition and/or the charge per mass of the toner particles in the toner composition by providing a charge control agent having limited solubility in the liquid carrier that is provided as an element separate from the charged toner particles. Because the charge control agent has limited solubility in the liquid carrier, the charge control agent can be provided in the form, for example of a solid, semisolid or gel, and thus is available for control of bulk conductivity of the toner composition and/or the charge per mass of the toner particles in the toner composition on an as needed basis without metered addition of additional ingredients.

Alexandrovich discloses an improvement of the prior-art liquid developers disclosed in the U.S. Pat. Nos. 4,273,849 and 4,252,921. These developers comprise a carrier liquid, dispersed toner particles, a carrier-soluble charge-control addition polymer and a carrier-soluble polar addition polymer to stabilize the dispersion of toner. The improvement is provided by incorporating an acidic monomer into the charge-control polymer. As noted in the Alexandrovich specification, the acidic monomer that is incorporated into the polymer is stated to be an insolubilizing monomer. Note, however, that this does not render the charge-control addition polymer to be insoluble in the liquid carrier, and there is no teaching or suggestion provided in Alexandrovich that the charge-control addition polymer be provided in an amount higher than the solubility of the charge control addition polymer in the liquid carrier. In contrast, the Alexandrovich claim specifically requires that the amount of solubilizing monomer present in the charge control addition polymer is sufficient to render the charge-control agent soluble in the liquid carrier. See column 8, lines 24-26. The Alexandrovich patent thus teaches away from the invention as described in the present claims as amended, which specifically require that the charge control adjuvant or matrix containing the charge control adjuvant has a limited solubility in the liquid carrier, is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier.

Veillette is cited for its discussion of soluble and insoluble charge control agents. Veillette is an example of a patent that uses the terminology "charge control agent" for the component that is identified in the present application as a charge director. Veillette is concerned with the dissociation of the charge director from the toner particle, particularly when the temperature of the composition increases. See column 1, lines 51-58. To solve this problem, Veillette provides a two-component polymeric mixture to impart a charge to the particle, which components are intimately mixed to promote retained association with the particle even under higher temperatures. See column 2, lines 21-27. Thus, Veillette provides no teaching with respect to charge control adjuvants as defined in the present specification and claims, and adds nothing to the Alexandrovich disclosure the would teach or suggest a system for printing a toner comprising a charge control adjuvant or matrix containing the charge control adjuvant has a limited solubility in the liquid carrier, is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier.

Yamamoto et al is another example of a patent that uses the terminology "charge control agent" for the component that is identified in the present application as a charge director. See, e.g. the disclosure in the abstract and at column 3, lines 35-36. Thus, this reference also provides no teaching with respect to charge control adjuvants as defined in the present specification and claims, and adds nothing to the Alexandrovich disclosure the would teach or suggest a system for printing a toner comprising a charge control adjuvant or matrix containing the charge control adjuvant has a limited solubility in the liquid carrier, is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier.

Kosel is cited for its disclosure of aluminum stearate as an insoluble charge director. This charge director is conventional in the toner art. Kosel provides no teaching with respect to charge control adjuvants as defined in the present specification and claims, and adds nothing to the Alexandrovich disclosure the would teach or suggest a system for printing a toner comprising a charge control adjuvant or matrix containing the charge control adjuvant has a limited solubility in the liquid carrier, is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier.

Because none of the above cited references teach or suggest the concept of a system for printing a toner comprising a charge control adjuvant or matrix containing the charge control adjuvant has a limited solubility in the liquid carrier, is provided as an element separate from the charged toner particles, and is present in an amount higher than the solubility of the charge control adjuvant or matrix in the liquid carrier, the combination of these references do not render the present claims obvious. Thus, even if taken in combination, the cited references fail to provide a motivation to the skilled artisan to provide the invention as presently claimed.

Conclusion

In view of the above remarks, it is respectfully submitted that the foregoing is fully responsive to the outstanding Office Action. Early favorable consideration of the above application is earnestly solicited. In the event that a phone conference between the Examiner and the Applicant's undersigned attorney would help resolve any issues in the application, the Examiner is invited to contact said attorney at (651) 275-9811.

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Respectfully Submitted,

By:________________________

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